

**DNP Project Manuscript**

**Interdisciplinary Pathway for Managing Urinary Tract Infections in Long-Term Care**

**Facilities: A Practice Improvement Project**

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**DNP PROJECT MANUSCRIPT**

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### Abstract

**Background:** Urinary tract infections (UTIs) are one of the most common infections within residents of long-term care facilities. Antibiotics are commonly prescribed for patients in this setting without proper diagnostic criteria. For these reasons, proper diagnosis of UTIs should be a priority in order to decrease the antibiotic prescribing rates and untimely improve patient health outcomes. This practice improvement project was aimed at training interdisciplinary staff on evidence-based UTI surveillance and implementing a toolkit within a 148-bed long-term care facility to evaluate the effect on documented UTIs and antibiotic prescribing rates.

**Methods:** This project was implemented in a 148-bed, long-term care facility in rural Northwest Alabama. A pre-post intervention was conducted to evaluate the education provided to interdisciplinary staff. The staff utilized a UTI toolkit and pre-post data concerning UTI rates and antibiotic prescribing rates was compared to determine the effectiveness of the UTI toolkit at reducing both UTI occurrence rates and overall antibiotic prescribing rates.

**Results:** Using a pre-post questionnaire and a paired sample t-test, a comparison of the questionnaire results was made. Post-test scores were improved compared to pre-test scores. A comparison of the pre-intervention facility UTI rates and all-cause antibiotic prescribing rates versus post-intervention rates was compared using *McNemar's Test*. UTI rates and overall antibiotic prescribing rates were reduced in the post-intervention phase compared to the pre-intervention phase of the practice improvement project.

**Conclusion:** This project improved assessment training for healthcare staff concerning UTI surveillance and reduced documented UTI rates and all-cause antibiotic prescribing rates.

**Keywords:** Long-term care OR nursing home OR residential care AND urinary tract infection OR UTI

Interdisciplinary Pathway for Managing Urinary Tract Infections in Long-Term Care Facilities:  
A Practice Improvement Project

## **Introduction**

### **Background**

Urinary tract infections (UTIs) are one of the most common reasons that residents receive antibiotics in nursing homes (Salem-Schatz et al., 2020). Consequently, antimicrobials are among the most regularly prescribed medications in long term care facilities, with up to fifteen percent of nursing home patients receiving antibiotics at any given time (Dyar, Pagani, & Pulcini, 2015). The majority of nursing home residents are geriatric, which are a vulnerable population (National Center for Health Statistics, 2019). It is estimated that 40-75% of antibiotic prescriptions in long term care facilities are potentially inappropriate (Lim, Kong, & Stuart, 2014). These inappropriate antibiotics can lead to adverse patient outcomes such as side effects including nausea and vomiting, increased costs due to excessive prescriptions, and contributing to multi-drug resistant infections (van Buul et al., 2015). Clostridium Difficile is a serious infection that can be fatal to the elderly. There is a direct correlation between the over-prescribing of antibiotics and Clostridium Difficile rates (van Buul et al., 2015). Studies also demonstrate growing antibacterial resistance rates in the long-term care setting for pathogens causing infections (Backus, 2015). For this reason, strict adherence to antimicrobial stewardship in long-term care facilities is needed to address these growing antimicrobial resistance rates, adverse effects, and increased costs. (Flokas, Alevizakos, Shehadeh, Andreatos, & Mylonakis, 2017).

Urinary Tract Infections are one of the main indications for antibiotic prescribing in long-term care facilities, and there are several contributing factors to this problem. Many times, a patient may have a change in condition, and staff nurses may falsely ascertain that a patient

suffers from a UTI and contact the health care provider for antibiotics. Due to the structure of the long-term care facility dynamic, access to quick diagnostic testing is not readily available. Most of these facilities do not have lab equipment and rely on outside laboratories to perform testing. Often due to lack of quick and sufficient testing in these facilities, medical providers feel the need to start antibiotics empirically, in the fear that the patient's condition may deteriorate if antibiotics are not started (Pattison, 2019). At times, medical providers are not as familiar with the patients compared to the nurses who care for them on a frequent basis. With most medical providers who are not physically being present in the facility and are unable to visualize the patient during the time of acute illness. Therefore, most of the medical information is conveyed telephonically from the staff nurse. Nurses play a key role in this situation, as their assessment skills have a direct effect on the patient's care and outcome. The nurse's opinion on the patient's condition has the ability to influence the medical provider's judgement and prescribing practices. The education of interdisciplinary staff on proper symptom criteria for UTI treatment is needed in order to help decrease unnecessary antibiotic prescribing and increase evidence-based guideline adherence.

### **Problem Statement**

Urinary tract infections are one of the most common infections within residents of long-term care facilities. Antibiotics are commonly prescribed for patients in this setting without proper justification and diagnosis criteria. The over-prescribing of antibiotics can lead to other complications such as increased antibacterial resistance, and secondary infections, such as *Clostridium Difficile*. For these reasons, proper diagnosis of UTIs in the long-term care setting should be a priority in order to decrease unnecessary antibiotic prescribing and untimely improve patient health outcomes. The *Revised McGeer Criteria* was published with the overall goal of

providing healthcare providers and workers a guideline to follow in order to better identify and treat actual UTIs versus asymptomatic bacteriuria within the long-term care setting (Stone et al., 2012). The *Revised McGeer Criteria* is a Centers for Disease Control and Prevention guideline for treatment of common infections within long-term care facilities, and therefore, open access is granted permission by the CDC. The intervention was aimed at training interdisciplinary staff on UTI surveillance and implementing the *Revised McGeer Criteria* as a UTI toolkit within a 148-bed long-term care facility to evaluate the effect on documented UTIs and antibiotic prescribing rates. The *Revised McGeer Criteria* for UTI diagnosis and treatment is depicted in Table A1 of Appendix A.

### **Organizational “Gap” Analysis of Project Site**

The national average of UTIs in nursing homes are 1 to 2.3 UTIs per 1,000 resident days (Mylotte, 2019). The long-term care facility in which the project was implemented had an average UTI infection rate of 3.2 UTIs per 1,000 resident days. These results demonstrated a need for improvement within the facility. With the UTI rate being higher than the national average, antibiotic prescriptions were higher as well. Decreasing the UTI rate within the facility would subsequently reduce the antibiotic prescribing rate, which would help to reduce potential adverse effects and improve overall patient health and outcomes. A GAP analysis was performed in order to compare the actual performance versus the potential performance of the facility with the implementation of a UTI symptom toolkit. With the current practice, residents identified with a UTI were being treated without any specific guidelines regarding when or when not to treat the infections. The planned intervention involved implementing the *Revised McGeer Criteria* to guide nurses and medical providers on UTI symptoms that warrant antibiotic therapy. The desired outcome was an improvement in nursing assessment concerning UTI symptoms, and an

improved adherence to evidence-based guidelines among medical providers. Upon attaining this goal, the facility would see a reduction in both overall UTI rates and antibiotic prescribing as well. The gap identified was that there was currently no system in place concerning a treatment policy for UTIs within the long-term care facility.

### **Review of the Literature**

A review of the literature was performed to gain more information on urinary tract infections within long-term care facilities, and the following three databases were searched: CINAHL, PubMed, and OVID. The search of all three databases was performed using the following search terms: Long-term care OR nursing home OR residential care AND UTI OR urinary tract infection.

### **Literature Search**

Studies were identified by using the search terms in CINAHL, PubMed, and OVID databases. Articles were screened that specifically consisted of interventions that were performed in long-term care facilities targeting nurses or medical providers with the intentions of measuring the effectiveness of these interventions at reducing UTI rates and antibiotic prescribing rates. The number of search results, articles reviewed, and articles used are demonstrated in Appendix A.

### **Inclusion/Exclusion criteria**

Inclusion criteria was defined as studies which were randomized controlled trials, quasi-experimental studies, educational studies, and retrospective analysis or observational studies that targeted long-term care residents, facilities, nurses, or medical providers by utilizing an intervention compared to standard practices or pre-intervention versus post-intervention in an attempt to improve UTI rates or antibiotic prescribing within this setting. Articles were excluded that only met portions of the inclusion criteria. Studies that used an intervention but were



performed outside of a long-term care facility were excluded. Studies in which the full text was not available were excluded, along with publications that were not written within the last five years.

### **Data collection**

A data collection table was used to synthesize the information (see Appendix A). The study design, sample/setting, interventions and comparisons, results, and the level of evidence were all compiled into a table to summarize these studies. The level of evidence was decided upon by utilizing the Johns Hopkins Nursing Evidence-Based Practice Model for evidence grading criteria (Dang & Dearholt, 2017).

### **Results**

The preliminary search provided 5,639 results. The search was refined to include articles that were less than five years old. This reduced the number to 2,211. The search was further narrowed to include full text articles only. This reduced the results to 947. Over 250 articles were screened for eligibility by the author based on the title or abstract. Articles were eliminated based on the inclusion and exclusion criteria. Ultimately, thirteen publications were selected for the review. One of the thirteen articles that were included was published in 2007. This article was included because it was a study that specifically dealt with implementing the *Revised McGeer Criteria* toolkit in a nursing home to determine the effect on UTI rates.

Of the thirteen studies, there were two randomized control studies, one systematic review, one pre/post experimental design, five retrospective/observational studies, two pre/post educational interventions, one cross-sectional study, and one prospective cohort study. The overarching theme to all of these studies was that both UTI toolkits and educational interventions aimed at both nursing and medical staff helped to reduce UTI rates, antibiotic prescribing rates,

or both. All thirteen articles were based within the long-term care setting. A few studies implemented procedures that educated nurses and/or medical providers on UTIs within the long-term care setting, focusing on evidenced-based guidelines concerning the diagnosis, treatment, and proper recognition of symptomatic UTIs versus asymptomatic bacteriuria. These studies found that the educational interventions were beneficial and overall reductions in the number of UTIs and antibiotic prescribing were achieved. Other studies implemented a nursing guide or toolkit which helped nurses to understand a certain criterion that patients should meet in order to receive treatment for a UTI. These studies also found that both the UTI rate and antibiotic prescribing rates were successfully reduced in the facilities in which the studies were performed.

### **Included Studies**

#### *Interventional Studies*

A pre-post experimental design conducted by Cooper, McFarland, Petrilli, & Shells (2019) utilized a UTI toolkit and was employed for staff to use clinically in order to determine UTI treatment criteria. The study results demonstrated a significant decrease in UTI rates, and it was concluded that UTI symptom toolkits can reduce documented UTI rates in long-term care facilities.

A pilot cluster randomized control study was performed to assess the effect of an antibiotic stewardship tool on antibiotic use for treatment of infections in long-term care facilities (Fleet et al., 2014). Implementation of an antibiotic toolkit for appraising infections was used for healthcare staff. The study demonstrated that the use of the toolkit was associated with a statistically significant decrease in total antibiotic prescribing rates.

Freeman-Jobson conducted a pre-post quality improvement project among 42 licensed and non-licensed healthcare workers (2016). Its aim was to assess the change in knowledge from

a pre-post evidence-based educational presentation. A paired sample dependent t-test demonstrated a substantial improvement in knowledge. The conclusion was that education regarding UTI symptoms and recognition is helpful to increase staff knowledge and awareness.

A study involving a pre-post questionnaire paired with a retrospective analysis was included (McMaughan et al., 2016). This was performed among 547 nursing home residents across 12 nursing homes in Texas. The aim was to evaluate the efficacy of a decision-making tool for urinary tract infection treatment for suspected UTIs. This study found that the decision-making aid improved overall antibiotic stewardship in long-term care facilities.

Another interventional based study was a cluster randomized control trial within 42 nursing homes whose goal was to measure the influence of an antibiotic stewardship program on the rate of UTI testing and antibiotic prescribing for UTIs between control and intervention sites (Pasay et al., 2019). Intervention sites received a staff educational intervention and a treatment guideline to use versus standard care in control facilities. The conclusion was that the intervention sites significantly decreased the rate of UTI testing and antibiotic prescriptions for UTI, without an increase in hospital admissions or mortality.

A quality improvement project was conducted by Pattison (2019), whose purpose was to measure if an implementation of an antibiotic stewardship program within a long-term care setting decreased the rate of antibiotic prescriptions for asymptomatic bacteriuria (ASB) in the elderly. An antibiotic stewardship protocol comprising of an educational session concerning antibiotic stewardship was implemented and utilized by health providers. Baseline data discovered that 64% of antibiotic prescriptions for suspected UTIs were written for ASB. Employing the antibiotic stewardship protocol decreased the rate of antibiotic consumption for ASB by 18%. It was determined in this study that the antibiotic stewardship protocol decreased

the rate of antibiotics prescribed for ASB in the elderly population of a long-term care facility.

The final interventional study was aimed at 21 long-term care nurses to determine if providing an educational intervention enhanced understanding and inhibition of urinary tract infections (Viner, 2020). Education regarding UTIs were implemented to nursing staff and a paired sample t-test was completed to assess the results. The test scores were increased, and it was concluded that providing an educational intervention for long-term care nursing staff advanced their knowledge and prevention of UTIs. antibiotic stewardship in long-term care facilities.

### *Analytical Studies*

A systematic literature review was included that observed policies to decrease UTIs in nursing home residents (Meddings et al., 2017). In this review, articles that were interventional studies with a comparison group reporting at least 1 result for UTIs were examined. It was determined that several procedures, such as improving hand hygiene, decreasing catheter use, and handling incontinence without catheters appeared to reduce UTI rates in long-term care residents.

An observational study was performed to investigate antibiotic susceptibility in urine samples from several long-term care facilities (Fleming, Barry, Byrne, & Prentice, 2017). A retrospective analysis of long-term care urine samples compared to general population urine samples was completed. The study concluded that long-term care facility urine samples are less sensitive to antibiotics than the general population.

A prospective observational study was conducted in 2019 within five Spanish hospitals involving 181 nursing home patients (Gómez Belda et al.). The goal was to determine the rate of insufficient antibiotic treatment in older nursing home residents with UTIs. The percentage of

empirical antibiotic treatment, length of hospital stays, and mortality were all evaluated. It was concluded that nursing home patients with urinary tract infections had a higher rate of antibiotic resistance than the general population.

A retrospective analysis of 13 long-term care providers was performed to analyze prescribing habits (Haaijman, Stobberingh, van Buul, Hertogh, C. M. P. M., & Horninge, 2018). The study aimed to determine long-term care provider prescribing practices relating to UTIs and comparing it to evidence based practice. An evaluation of antibiotic prescriptions for UTIs and urine cultures was performed, and it was concluded that in the majority of patients, antibiotic therapy was not changed when urine culture results demonstrated that a change was necessary.

Another included study was a perspective cohort study of 340 long-term care residents whose aim was to assess patients with a suspected UTI to evaluate whether they met the *McGeer*, *Loeb*, or *Revised Loeb* consensus-based criteria (Juthani-Mehta et al., 2007). Participants underwent surveillance for approximately one year. Using laboratory indications of a UTI as a conclusion, the *McGeer Criteria* demonstrated 30% sensitivity, 82% specificity, 57% positive predictive value, and 61% negative predictive value (Juthani-Mehta et al., 2007). This study determined that using the *McGeer Criteria* can aid in detecting long-term residents with a UTI.

The final included analytical study was a cross-sectional analysis that was performed on 450 long-term care residents to measure the occurrence of documented UTI, generic symptoms, and antibiotic treatment of suspected UTIs in long-term care facilities (Mayne, Sundvall, & Gunnarsson, 2018). In this study, UTIs were responsible for 33% of all infections treated with antibiotics. This study also concluded that UTIs are often documented in long-term care patients, with confusion being one of the main factors related to antibiotic treatment for UTIs.

**Discussion**

In this review of studies, there was evidence to support that educational interventions aimed at nurses and long-term care prescribers were effective in reducing antibiotic prescribing rates and documented UTI rates (Freeman-Jobson, 2016) (Viner, 2020). There was also evidence to show that medical providers prescribe antibiotics unnecessarily, which potentially puts patients at risk for adverse effects (Haaijman, Stobberingh, van Buul, Hertogh, C. M. P. M., & Horninge, 2018). In many cases, prescribers are frequently off-site and make rounds only at certain pre-determined times within these types of facilities. Medical providers are often times making judgment calls and initiating treatments to the elderly nursing home patients from afar or over the phone without quick access to laboratory testing (Pattison, 2019). The nature and environment of long-term care facilities contributes to frequent antibiotic prescribing. Elderly people are also more susceptible to infections, making this a vulnerable population (Pasay et al., 2019). Overusing antibiotics can lead to increased antimicrobial resistance rates and can also lead to a clostridium difficile infection, which can have devastating effects on this already weakened population. Providers often times prescribe antibiotics at higher rates due to the fear that the patient may worsen if not treated promptly. While this can be true, judicious prescribing practices must also be considered, as there are consequences of antibiotic use and these medications are not without their own set of possible negative outcomes (Meddings et al., 2017).

**Future research**

Interventions aimed at reducing UTIs and antibiotic prescribing have been well studied, but studies focusing specifically with long-term patients are lacking. The lasting implications of these interventions also need more research to better understand the future impact these interventions may have. The intervention's direct link to mortality, hospitalization rates, infection

rates and outcomes are all topics that need to be addressed in future research for the medical community to gain a better understanding of the enduring impact on UTI diagnosis and treatment within long-term care facilities.

### **Limitations**

There were several variations across the studies, which made the evaluation of study results problematic. The variations occurred in the population size, patient co-morbidities, how "inappropriate" antibiotic prescribing was defined, measurement differences of UTI rates, and the differences in the type of education that was administered to nursing and medical staff. With the lack of studies focusing on long-term care, more studies are necessary to improve understanding on this topic within the long-term care environment.

### **Implications for practice**

Antibiotic stewardship plays an important role in the daily job duties of long-term care medical professionals. The diagnosis and treatment of communicable illnesses in the older populace, particularly within nursing homes, are very challenging for healthcare providers who provide care for this cohort of patients (Jump et al., 2018). Treatment of infections are commonplace in the nursing home setting, as many elderly residents have co-morbid conditions which put them at increased risk of contracting an infection (Pasay et al., 2019). Long-term care medical providers and nursing staff need proficient understanding of the adverse effects of antibiotics as well as when patients warrant antibiotic therapy to treat UTIs. Educating patients and their families about antimicrobial adverse effects can have a positive impact, lessen confusion, and reduce communication barriers between the patient and the healthcare staff (Freeman-Jobson, 2016). Improving antibiotic stewardship with a proactive approach should be a common goal within all long-term care facilities to improve patient health outcomes. Future

education should be directed at medical staff, nursing staff, patients, and their families to promote a better understanding of appropriate antibiotic usage and UTI treatment guidelines.

### **Conclusion**

This review of literature provided evidence that educational interventions focused on medical and nursing staff are effective at decreasing UTI rates and antibiotic prescribing rates. Implementing UTI toolkits or guides for nurses and healthcare providers were also effective at decreasing these rates (Cooper, McFarland, Petrilli, & Shells, 2019) (Fleet et al., 2014). There was also evidence that medical providers often times prescribe antibiotics unjustifiably due to a number of factors and issues (Haaijman, Stobberingh, van Buul, Hertogh, C. M. P. M., & Horninge, 2018). Investigating further to gain insight into the long-term effects of interventions aimed at improving antibiotic stewardship such as mortality, hospitalization rates, and infection rates are warranted. Further investigation into the factors influencing provider's prescribing habits in long-term care, such as patient preference or other external pressures, are also needed to better understand the issue in hopes of further improving UTI rates and antibiotic prescribing rates within long-term care facilities.

### **Evidence-based Practice: Verification of Chosen Option**

The Quality Improvement (QI) option that was chosen is the Standards for Quality Improvement Reporting Excellence (SQUIRE) guidelines (Squire, 2008). These guidelines were implemented based on the review of the literature. Given the problem and the intervention that has been proposed, the following question was then formulated: In long-term care facilities, how does educating interdisciplinary staff on evidence-based UTI surveillance and implementing a UTI surveillance toolkit, compared to standard practices, affect antibiotic prescribing and UTI rates over one months' time?



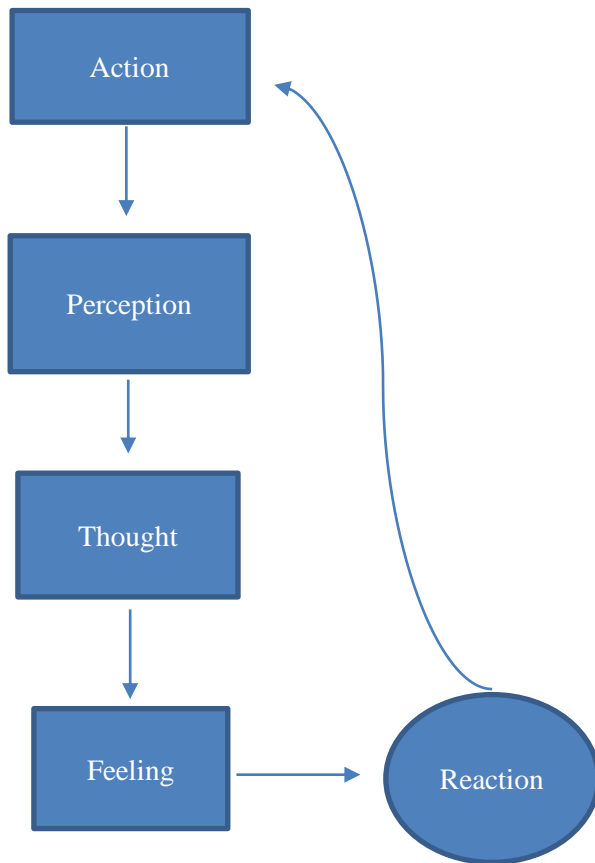
### **Theoretical Framework**

Orlando's Theory of the Deliberative Nursing Process was considered for this scholarly project. It was first written in 1961 by Ida Jean Orlando. The Deliberative Nursing Process Theory emphasizes the communication between the nurse and patient, perception validation, and the use of the nursing process to yield constructive results or patient improvement. Orlando's main effort was to define the purpose of nursing. The primary component of this theory is the interaction between the nurse and the patient, and the intellectual processes that take place by the nurse during the interaction. The chief concept of this model explains that the role of a nurse is to identify and improve the patient's current needs. The patient's health needs could be obvious. However, what a patient needs may not be as it seems initially. Because of this, nurses have to utilize their own perceptions, insights, and their own personal experience to explore the meaning of the patient's behavior. It gives nurses a clear and consistent approach while dealing with direct nursing care. This theory is especially relevant to clinical issues, just like the problem that has been proposed. In using Orlando's theory, the nurse identifies his or her own perceptions, thoughts, and feelings about the patient's behaviors or condition (Potter & Tinker, 2000). The nurse then validates these perceptions with the patient. If the theory is validated, the nurse then formulates deliberate nursing actions to meet the patient's immediate needs. The process of using the *Revised McGeer Criteria* for UTIs falls directly in line with Orlando's theory. The nurse is observing for any new signs or symptoms of a UTI in the long-term resident. If the nurse notices a change in the patient's baseline condition, then he or she will assess the patient and compare them using the criteria. If these perceptions are validated upon assessment, the nurse will then contact the medical provider to get the patient prompt attention to meet their immediate needs. Nurses who are able to properly use this theory and way of thinking are better equipped to

provide accurate and reliable information to medical providers which will improve overall patient outcomes.

**Figure 1**

*Orlando's Theory of Deliberative Nursing Process – Author developed*



### **Conceptual Framework**

A meta-synthesis of qualitative research was performed to investigate the contributing factors that influence antibiotic prescribing in long-term care facilities (Fleming, Bradley, Cullinan, & Byrne, 2015). The synthesis of eight qualitative studies gave evidence that health care providers and administrators have identified aspects that impact antibiotic prescribing within the long-term care setting. These influencers include differences in knowledge and practice among health care providers in the long-term care setting, which is unique, due to the multifaceted patient population and limited access to physicians and diagnostic testing. The social issues behind the interaction between health care workers, residents' families and medical providers also impact decision making concerning antibiotic prescribing. This study also concluded that there was a recognized need for collaborative, evidence-based antimicrobial stewardship strategies specific to long-term care facilities, as antibiotic prescribing is profoundly influenced by aspects exclusive to this setting.

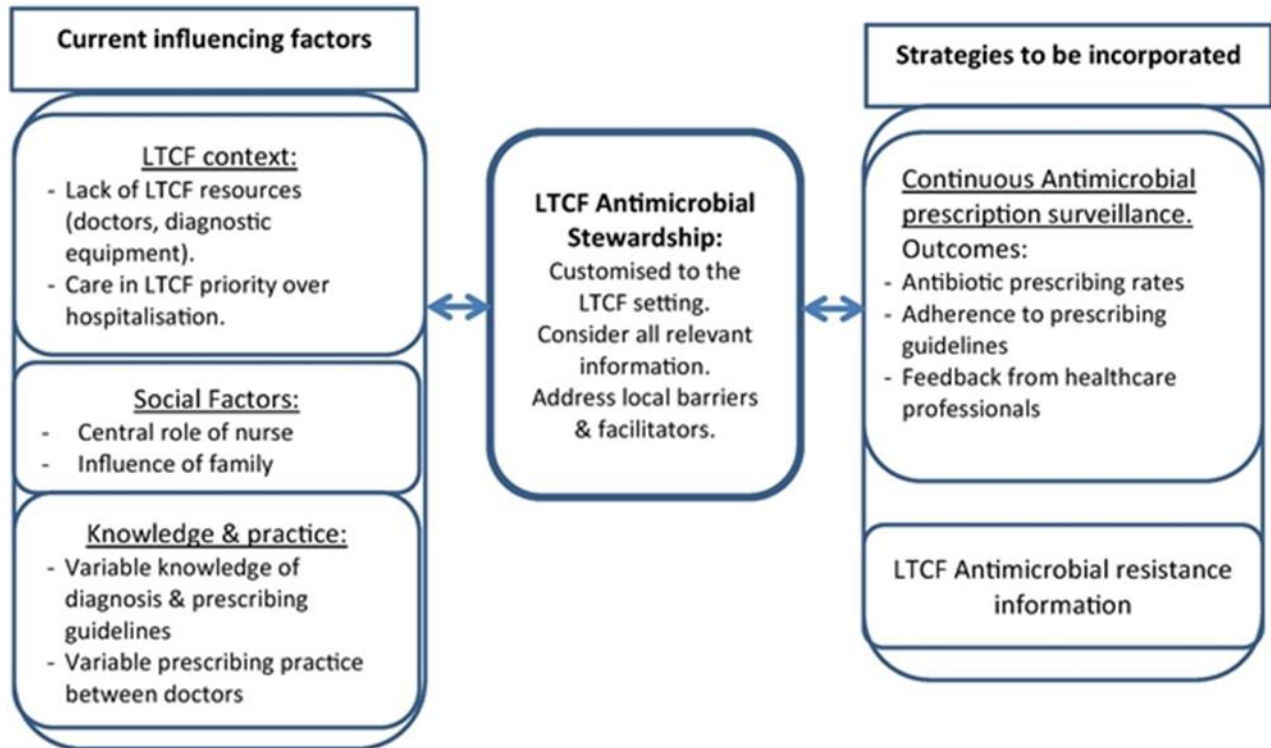
This study provided evidence of the daily challenges health care workers face in regard to antibiotic prescribing in long-term care. Numerous factors are unique only to the long-term care setting, which is accompanied by its own set of challenges and obstacles that have the ability to hinder utilizing evidence-based practice guidelines. A lack of resources in long-term care facilities are one of these issues. Access to medical providers and quick diagnostic testing is not commonplace. In many facilities, simple blood draws have to be sent to an outside laboratory and, at times, standard lab tests can take days. Most physicians do not work full time in long-term care facilities, and only make medical rounds at pre-determined times. Nurses are uniquely positioned in this setting, as they are the ones with the highest level of medical education in these facilities at certain times. The nurses' assessment of patients is of paramount importance, as it is

their interpretation of the patient's condition that is relied upon by medical providers, as many order changes and prescriptions originate telephonically from phone conversations between nursing staff and providers. Other issues, such as social factors, contribute to increased antibiotic prescribing. Many times, family or next of kin to the patient requests antibiotic treatment for their loved one. In certain cases, antibiotic therapy may not be warranted, but providers honor the request as to not upset the family and cause any social discord. This tends to be a major issue in many long-term care facilities, as the general public and families have not been very well educated over the years about the proper indications for prescribing antibiotics. The last factor deals with knowledge and practice. Medical providers have different philosophies behind their prescribing practices, and this creates variation among providers. There is also variable knowledge of diagnosis and prescribing guidelines within long-term care, which influences antibiotic prescribing rates as well.

Using constructs developed by Fleming, Bradley, Cullinan, and Byrne as a conceptual framework can aid in the understanding of the factors that influence antibiotic prescribing practices within long-term care facilities and help to facilitate discussions and future research into potential solutions for the issues at hand.

**Figure 2**

*Conceptual model of the factors influencing antibiotic prescribing in long-term care facilities and recommendations for interventions – Author developed*



**Goals, Objectives and Expected Outcomes**

The project director provided education to the nursing staff of the long-term care facility concerning the implementation of an evidence based UTI surveillance tool. Interdisciplinary staff was given a questionnaire pre-post education to determine the effectiveness of the education at improving knowledge and understanding. The questionnaire can be viewed in Appendix B. The educational in-service was in the form of a PowerPoint presentation, and the education was provided by the project director. After the educational pre-intervention phase, a UTI toolkit was then implemented throughout the facility. The UTI rates and antibiotic prescribing rates were measured one month after the implementation, and then compared with pre-implementation data. Data were then analyzed to determine if the intervention had a positive effect on UTI or antibiotic

prescribing rates. The goal and expected outcome of the project was to improve the assessment of UTI symptoms among nurses and improve adherence to evidence-based guidelines for medical providers. After the project was concluded, participants were encouraged to provide anonymous feedback and suggestions, such as barriers that were faced and the difficulty level of adhering to guidelines.

### **Barriers**

Barriers can hinder and potentially negatively influence the successfulness of the practice improvement project. One possible barrier was staff buy-in. Education must be provided to interdisciplinary staff in order to emphasize the understanding of the perils of antibiotic over-prescribing and antibiotic resistance. Having a staff that is bought-in and receptive to facilitating a positive change, with the common goal of improving patient health, is of the utmost importance.

## **Methods**

### **Project Design**

This project was a quality improvement project aimed at training interdisciplinary staff in long-term care facilities on evidence based UTI surveillance and implementing a UTI surveillance toolkit, compared to standard practices, to determine the effect on antibiotic prescribing and UTI rates over one months' time. Quantitative data were measured in order to determine the effectiveness of the project. All data were reported in aggregate fashion. Recruitment letters inviting participation in the project were developed and displayed at nurses' stations around the facility, inviting voluntary participation. The invitation letter can be referred to in Appendix C. Various in-service times were given to allow staff the convenience of participation. Staff who chose to participate attended one of the offered in-service times. Folders

were made for participants that included a consent form, educational material, a pre-test, and a post-test. The consent form and general information concerning the project was addressed by the primary investigator (see Appendix D). Staff participation was voluntary and without penalty for non-participation. For the staff who volunteered to participate, a pre-test was conducted to assess pre-intervention UTI evidence-based knowledge. Both the pre and post tests were numbered as to be able to track the participant's scores, but the tests were anonymous and free of identifying information. There was a drop box for participants to place their questionnaires inside, as to further protect anonymity. After the pre-test was complete, education was then provided by the primary investigator in the form of a PowerPoint presentation concerning evidence-based practice for UTI surveillance and treatment criteria. Education was provided concerning the *Revised McGeer Criteria* for UTI Surveillance, which is the toolkit that was implemented throughout the facility. After the education was complete, a post-test was then obtained in order to assess the effectiveness of the education. As with the pre-test, the post-test was placed in a drop box to protect privacy as well. Baseline average UTI occurrence rates and UTI antibiotic prescribing rates was obtained prior to the implementation of the *Revised McGeer Criteria* toolkit. The averages of these rates were based on the previous year of pre-intervention data. The UTI surveillance toolkit was subsequently implemented in the workplace for nurses to use in order to identify patients who met criteria to be treated for UTIs. Targeted placement of the surveillance criteria was posted at each nurses' station. One month after implementation, the UTI occurrence rate and overall antibiotic prescribing rates were measured again and compared with pre-implementation baseline data in order to determine the project's effectiveness at reducing the occurrence rates. Upon the completion of the project, participants were asked to voluntarily fill out an anonymous feedback form to gain insight into some of the barriers or issues that were

faced during the study (see Appendix E).

### **Project Site and Population**

This project was conducted in a 148-bed long-term care facility in rural Northwest Alabama. This facility was a stand-alone family operated facility and has been in business for over 30 years. Stakeholders included medical providers, facility owners, facility administration, and Director of Nursing. Resources needed for this improvement project were minimal. The cost for implementing this project was very low. The cost benefit was much greater than the actual cost, as this project has the potential to save healthcare dollars spent on UTI treatment and supplies if reductions do, in fact, occur. Participants in the project included the project director, medical director, nurse practitioner, facility nurses, and facility infection preventionist. The residents of the facility were a diverse group of patients with many differing chronic medical problems. There was a mix of both male and female patients. The goal of participating staff was 15 individuals, and the actual number of participants totaled 11. The participants included one physician, one nurse practitioner, and a mixture of registered nurses and licensed practical nurses.

In this long-term care facility, nursing care is provided to nursing home residents 24 hours per day by licensed nurses. At the time before project implementation, the nursing facility did not have any standard guidelines or practices for UTI diagnosis and treatment. Many times, if a patient became confused or had a mental status change, the patient's nurse would call a medical provider and a urinalysis would possibly be obtained to check for a UTI. Patients were treated with antibiotics for presumed urinary tract infections that could possibly be asymptomatic bacteriuria, and there could be a different medical reason for the patient's change in condition. For this reason, treating patients with antibiotics for UTIs only when they meet proper symptom



criteria as evidenced by the *Revised McGeer Criteria* had the potential to decrease UTI and antibiotic prescribing rates within the facility.

### **Measurement Instruments**

A questionnaire was developed by the project director that facility staff completed prior to being educated on the *Revised McGeer Criteria* for UTI symptom identification and treatment. The staff participated in the test again after the educational intervention, in order to determine the effectiveness of the education delivery. The results of the two tests were measured with a paired sample t-test. UTI occurrence rates and all-cause antibiotic prescribing rates were obtained prior to the implementation of the *Revised McGeer Criteria* toolkit, and again one month after the implementation. Data were compared using the *McNemar's Test* order to evaluate the project's ability to reduce UTI and antibiotic prescribing rates.

### **Data Collection Procedures**

In the pre-intervention phase, the project director obtained baseline UTI occurrence and antibiotic prescribing rates by analyzing data that is compiled and recorded by the facility infection preventionist. The averages of these rates were based on the previous year of pre-intervention data. Monthly UTI and antibiotic prescribing rates within the facility were already collected and calculated by the facility's Infection Preventionist, so there was no requirement for manual chart reviews. These numbers were recorded and analyzed by the project director. The facility physician, nurse practitioner, and nurses were given a pre-test on UTI treatment criteria, and these scores were recorded. A post-test was given again after education was provided on the *Revised McGeer Criteria* toolkit, and these test results were recorded and compared to the pre-education scores. Each question was evaluated as to the percentage of staff who answered incorrectly, as this could give evidence to areas of increased need or focus. These pre- and post-

tests were anonymous and free of identifying information. All data was reported in aggregate form.

During the implementation phase, the toolkit was put into place and used by nurses as a symptom guide for identifying patients who met criteria to be treated for UTIs. The toolkit was displayed at the nurses' stations and copies were also provided to the facility physician and nurse practitioner. No data was collected during this time period.

After one month, the post-implementation phase came into effect. UTI occurrence rates and antibiotic prescribing rates were obtained again by the project director and this data was analyzed and compared against the pre-implementation data using the *McNemar's Test*. Opportunities for anonymous feedback was available to participants. A suggestion box was available for participants to voice any concerns, barriers, or problems that were identified. Feedback from participants was encouraged.

### **Data Analysis**

Inferential statistical analytics were utilized to measure the effectiveness of the UTI toolkit was evaluated by examining the UTI occurrence rate and antibiotic prescribing rates. These rates were collected from the pre-post implementation phases and compared to one another. The data collected from the pre-post-intervention staff questionnaires were analyzed with a paired sample t-test. The paired sample t-test is intended to be used to determine if there is statistical evidence that there is a significant difference between paired observations (Yeager, 2021). This test would identify if there was a statistically significant result after implementation of the educational based intervention. The differences in UTI rates and antibiotic prescribing rates were compared using *McNemar's Test*, which is used to compare paired nominal data to determine if there is a significant difference between the two means of data (Laerd statistics,

2018).

### **Cost-Benefit Analysis/Budget**

Financial costs involved with this project were minimal. Costs consisted of the following: folders, paper, printing, drop box, and the time it took for the staff to be educated on the new practice improvement project. Staff were educated during various in-service times, to provide convenience to participants. These in-services were conducted while staff were already at the facility working, to further minimize costs. The cost of the folders, paper, printing, and drop box was estimated to be approximately \$25. The potential financial benefits for the facility far outweigh the cost. The possible reduction of UTI rates and antibiotic prescriptions can produce a positive financial impact on the facility by reducing costs associated with medical supplies and drug prescriptions.

### **Timeline**

The first four weeks of the project was the pre-implementation phase. The first week consisted of a project awareness campaign. During this period, recruitment was the focus. Invitation letters were posted at the nurses' stations inviting staff to voluntarily participate in the project. There were three different in-service dates and times that staff could choose to attend if they elected to participate in the study. During the second, third, and fourth weeks, in-services took place and participants were given a pre-education test followed by a post-education test after the instruction was given concerning the implementation of the UTI toolkit and evidence-based practice guidelines for UTI surveillance. Test results were analyzed to determine the effectiveness of the education. After the first four weeks were complete, the implementation phase of the project began. Implementation of the evidence based UTI toolkit took effect and lasted for four weeks. The project director was available during this time to answer questions that

staff may have had concerning the new protocol. After the eight-week study was complete, the post-implementation phase began. The UTI occurrence rates and antibiotic prescribing rates were re-collected and analyzed. The results were compared to pre-implementation data to evaluate the effectiveness of the project at reducing documented UTIs and antibiotic prescribing rates. The full project timeline is displayed below.

**Table 5**

*Project Timeline*

<p><b>Week 1: Awareness Campaign</b></p>	<p><b>During this period, recruitment was the focus. Invitation letters were posted at the nurses’ stations inviting staff to voluntarily participate in the project if desired. There were three different in-service dates and times that staff could choose to attend if they elected to participate in the study.</b></p>
<p><b>Weeks 2-4: Pre-implementation Phase</b></p>	<p><b>Staff were given a pre-education test followed by a post-education test after instruction was given concerning evidence-based practice guidelines and the implementation of the UTI toolkit. Test results were analyzed to determine the effectiveness of education.</b></p>
<p><b>Weeks 5-8: Implementation Phase</b></p>	<p><b>Implementation of the evidence based UTI toolkit began. The project director was available to answer questions that interdisciplinary staff may have had concerning the new protocol.</b></p>

<b>Week 9: Post-Implementation Phase</b>	<b>Re-collection of UTI occurrence rates and UTI antibiotic prescribing rates were obtained and analyzed. The results were compared to pre-implementation data to evaluate the effectiveness of the intervention. Feedback/suggestions from participants was be encouraged.</b>
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### **Ethical Considerations/Protection of Human Subjects**

The University of Alabama (UA) Institutional Review Board (IRB) approval was obtained prior to initiating this practice improvement project. Additionally, Standards of Care for practice within the long-term care facility were carefully followed. All information collected as part of evaluating the impact of this project was aggregated data from the project participants and did not include any potential identifiers. Staff participation was completely voluntary, and the pre-post tests were anonymous. Consent was obtained prior to participation (see Appendix D). The consent outlined the project plan and emphasized that participation was completely voluntary. Pre-post questionnaires were numbered instead of containing participant identifiers. There was a drop box for participants to place both the pre and post-test questionnaires, to further insure anonymity.

### **Results**

Inferential statistical analysis was performed using IBM SPSS Statistics software (IBM, 2020). A comparison was made between pre-education questionnaire results versus post-education questionnaire results using a paired sample t-test. This analysis was performed to evaluate whether knowledge concerning the *Revised McGeer Criteria* improved after the educational intervention. A significant increase ( $P < 0.001$ ) in the scores on the *Primary*

*Investigator Assessment of Knowledge of UTI Surveillance Based on the Revised McGeer Criteria* was observed from the mean pre-test score of 82.91 ( $M=82.91$ ,  $SD=9.17$ ) compared to the mean post-test score of 96.36 ( $M=96.36$ ,  $SD=5.39$ ). The test results were  $t = 6.1024$ ,  $p<0.001$ . This difference in test scores is considered to be a statistically significant result, indicating the educational intervention was greatly effective at increasing understanding and knowledge concerning the *Revised McGeer Criteria* guidelines for UTI Surveillance. The paired sample t-test is displayed below.

**Table 6**

*Educational Questionnaire Paired Sample T-Test*

<b>Group</b>	<b>Pre-Test Average Score</b>	<b>Post-Test Average Score</b>
Mean	82.91	96.36
SD	9.17	5.39
SEM	2.76	1.63
N	11	11
$t = 6.1024$		

Urinary tract infection rates were analyzed in both the pre and post intervention period.

UTI rates were calculated per 1,000 resident days by using the following formula: number of infections divided by resident days multiplied by 1,000. The facility's pre-intervention average UTI rate was 3.2 per 1,000 resident days. The post-intervention rate was determined to be 2.3 UTIs per 1,000 resident days. A *McNemar's Test* was performed to determine the significance of the difference in these rates. The test showed that the two rates were not significantly different from one another,  $p=0.314$ .

**Table 7***McNemar's Test on UTI Rates*

	<b>Post-Intervention Positive</b>	<b>Post-Intervention Negative</b>	<b>Totals</b>
<b>Pre-Intervention Positive</b>	18	101	119
<b>Pre-Intervention Negative</b>	109	192	301
<b>Totals</b>	127	293	420
<b>Results</b>	P = 0.314	Test Statistic = 0.233	Odds Ratio = 0.92661

The overall antibiotic prescription rate for all infections was 11.4 per 1,000 resident days (34.9%) in the pre-intervention versus 10.3 per 1,000 resident days (31.9%) post-intervention. A *McNemar's Test* was also performed on these results, and the test determined that the difference in these results were not statistically significant,  $p=0.472$ .

**Table 8***McNemar's Test on Antibiotic Prescribing Rates*

	<b>Post-Intervention Positive</b>	<b>Post-Intervention Negative</b>	<b>Totals</b>
<b>Pre-Intervention Positive</b>	71	106	177
<b>Pre-Intervention Negative</b>	104	139	243
<b>Totals</b>	175	245	420
<b>Results</b>	P = 0.472	Test Statistic = 0.00476	Odds Ratio = 1.01923

In evaluating the data, facility UTI rates and overall antibiotic prescriptions decreased after the project intervention from a clinical standpoint, but not a statistically significant amount according to statistical testing.

### Discussion

This practice improvement project displayed promising results aimed at decreasing UTI infection rates and antibiotic prescribing rates within a 148-bed long-term care facility. The educational intervention designed for medical staff is vital to allow for staff buy-in on the initiative, and to improve understanding on proper symptom criteria for UTI treatment. The questionnaire test scores were significantly improved after the educational intervention, which indicates that the medical staff had an improvement in knowledge of the newly implemented guidelines. The average pre-educational intervention score average was 83% versus a post-education average score of 96%. This provides evidence that education is beneficial to interdisciplinary staff in improving knowledge on UTI symptom surveillance. The *Revised McGeer Criteria* for UTI Surveillance was posted at the nurse's stations throughout the facility, which allowed staff to easily reference the guidelines when contemplating patient symptom criteria. Nursing staff appeared to be engaged and accepting of the treatment guidelines and protocol. Prescribers also appeared to be engaged in the project, with the primary goal being to decrease UTI rates and antibiotic prescriptions.

Upon analyzing UTI rates, the intervention did reduce overall documented UTIs. All-cause antibiotic prescriptions were also slightly reduced. From a clinical standpoint, this intervention did seem to be effective at reducing both of these rates, which can have many positive effects. Reducing the amount of UTIs and antibiotic prescriptions not only improves quality scores and reduces costs, but also improves patient care by not exposing residents to inappropriate antibiotic usage. The rates at which the UTIs and prescribing rates declined were not substantial. There remain several questions and barriers that are potentially influencing factors concerning this project. The implementation phase of this project consisted of 4 weeks.



The UTI surveillance criteria have been adopted by the project facility and will continue to be used in the future, so it remains to be seen what impact on these rates will be as time progresses.

### **Evaluation of Processes**

An outcome evaluation was performed following the conclusion of the project. Due to the positive results seen in relation to UTI rates and antibiotic prescribing, it was concluded by key stakeholders that the newly implemented UTI guidelines would continue to be used within the long-term care facility as a way to improve patient care. The guidelines give medical staff a clear set of evidence-based criteria to follow, which allows for consistency between providers and provides clear understanding to all nursing staff as well. Having a standard treatment protocol also appeared to improve overall communication concerning UTI symptom criteria. Due to each of these positive effects, the long-term care facility decided to incorporate the *Revised McGeer Criteria* into their treatment guidelines for future use.

### **Sustainability**

This project will easily be sustainable for continued future use. From an economic standpoint, the cost is minimal compared to the potential improved patient care, quality scores, and decreased prescription and medical supply costs. Upon project implementation, the only continuous task is sustaining staff education and adherence to the treatment criteria, which can be addressed on standard in-services that are usually already being conducted. With the efforts of the facility medical director, medical providers, administrator, and director of nursing, this quality improvement process can effectively be continued with minimal cost or effort.

### **Dissemination**

This project was disseminated to the project site's sister facility in order to initiate the practice improvement project there as well. The results of the study were also shared with other

local long-term care facilities in order to spread knowledge and information concerning this matter. The manuscript has been sent to various medical journals for potential publishing, such as *The Journal of Post-Acute and Long-Term Care Medicine* and *the Journal of Gerontological Nursing*.

### **Limitations**

Several limitations exist and should be considered in order to continue to improve upon the project implementation and findings. Staff participating in the study were asked to fill out anonymous surveys at the conclusion of the implementation concerning barriers that were observed. An overwhelming and near consensus response was the fact that either residents or their families were resistant to the treatment guidelines, which pressured medical providers to prescribe antibiotics. The resistance to treatment guidelines potentially relates to the evidence by the fact that antibiotic prescribing rates were reduced some, but not dramatically. According to participants, often times facility residents or their family members felt that they had a UTI and requested that they be treated with antibiotics despite the patient not meeting proper treatment criteria. This is felt to be an issue among medical providers within long-term care facilities that they deal with on a daily basis, and this potentially could lead to increased numbers of inappropriate antibiotic usage (Pattison, 2019). At times, due to these external pressures, medical providers feel that it is easier to prescribe a patient an antibiotic to keep either the patient or their families satisfied with the care that they are receiving. Similar to the findings reported by Pasay (2019), it was determined that at times when healthcare providers do not prescribe antibiotics, the general public can easily become dissatisfied with the provider and feel like they are not receiving adequate treatment, when the reality is the fact that their acute illness does not warrant antibiotic usage. Educating residents and families on the dangers of overusing antibiotics and

proper treatment criteria is a key component to further improve upon patient care and reduce inappropriate antibiotic prescribing. Further evaluation and insight into the external factors that pressure medical providers to prescribe is warranted to gain a better understanding on this matter.

### **Conclusion**

Urinary tract infections are one of the most common reasons that residents receive antibiotics in nursing homes. Evidence suggests that UTIs are many times unnecessarily treated in the long-term care setting, leading to increased antibiotic prescriptions. These inappropriate antibiotic prescriptions can lead to negative patient outcomes such as adverse effects, increased costs, and contributing to multi-drug resistant infections. Proper identification, diagnosis, and treatment of UTIs in the long-term care setting should be a priority in order to decrease the antibiotic prescribing and untimely improve patient health outcomes. Educating interdisciplinary staff to understand proper UTI treatment criteria is a key component to successfully implementing this practice improvement project. Instituting the *Revised McGeer Criteria* for UTI Surveillance as a screening tool for UTI symptom identification has the potential to reduce unnecessary antibiotic prescribing and reduce overall UTI rates. Achieving this goal will improve overall patient health and outcomes within the long-term care setting.

### References

- Backus, D. (2015). Antimicrobial therapy in long-term care: Controversy, colonization, and criteria. *The Consultant Pharmacist: The Journal of the American Society of Consultant Pharmacists*, 30(9), 513-522. doi:10.4140/TCP.n.2015.513
- Cooper, D., McFarland, M., Petrilli, F., & Shells, C. (2019). Reducing inappropriate antibiotics for urinary tract infections in long-term care: A replication study. *Journal of Nursing Care Quality*, 34(1), 16-21. doi:10.1097/NCQ.0000000000000343
- Dang, D., & Dearholt, S. (Eds.). (2017). *Johns hopkins nursing evidence-based practice: Model and guidelines (3rd ed.)*. Indianapolis, IN: Retrieved from [https://www.hopkinsmedicine.org/evidence-based-practice/ijhn\\_2017\\_ebp.html](https://www.hopkinsmedicine.org/evidence-based-practice/ijhn_2017_ebp.html)
- Dyar, O., Pagani, L., & Pulcini, C. (2015). Strategies and challenges of antimicrobial stewardship in long-term care facilities. *Clinical Microbiology and Infection*, 21, 10-19. doi:10.1016/j.cmi.2014.09.005
- Fleet, E., Gopal Rao, G., Patel, B., Cookson, B., Charlett, A., Bowman, C., & Davey, P. (2014). Impact of implementation of a novel antimicrobial stewardship tool on antibiotic use in nursing homes: A prospective cluster randomized control pilot study. *The Journal of Antimicrobial Chemotherapy*, 69(8), 2265-2273. doi:10.1093/jac/dku115
- Fleming, A., Barry, L., Byrne, S., & Prentice, M. (2017). Antimicrobial susceptibility of long term care facility and general practice urine samples in patients 65 years and older: An observational study. *European Journal of Public Health*, 27(2), 307-312. doi:10.1093/eurpub/ckw138

- Fleming, A., Bradley, C., Cullinan, S., & Byrne, S. (2015). Antibiotic prescribing in long-term care facilities: A meta-synthesis of qualitative research. *Drugs & Aging, 32*(4), 295-303. doi:10.1007/s40266-015-0252-2
- Flokas, M. E., Alevizakos, M., Shehadeh, F., Andreatos, N., & Mylonakis, E. (2017). Extended-spectrum  $\beta$ -lactamase-producing enterobacteriaceae colonisation in long-term care facilities: A systematic review and meta-analysis. *International Journal of Antimicrobial Agents, 50*(5), 649-656. doi:10.1016/j.ijantimicag.2017.08.003
- Freeman-Jobson, J. H. (2016). Quality/performance improvement. effect of an education presentation on the knowledge and awareness of urinary tract infection among non-licensed and licensed health care workers in long-term care facilities. *Urologic Nursing, 36*(2), 67-71. doi:10.7257/1053-816X.2016.36.2.67
- Gómez Belda, A. B., De la Fuente, J., Diez, L. F., Capdevila, J. A., Inglada, L., Arca, A., Artero, A. (2019). Inadequate empirical antimicrobial treatment in older people with bacteremic urinary tract infection who reside in nursing homes: A multicenter prospective observational study. *Geriatrics & Gerontology International, 19*(11), 1112-1117. doi:10.1111/ggi.13776
- Haaijman, J., Stobberingh, E. E., van Buul, L. W., Hertogh, C. M. P. M., & Horninge, H. (2018). Urine cultures in a long-term care facility (LTCF): Time for improvement. *BMC Geriatrics, 18*(1), 1-8. doi:10.1186/s12877-018-0909-x
- IBM Corp. Released 2020. IBM SPSS Statistics for Windows, Version 27.0. Armonk, NY: IBM Corp
- Jump, R. L. P., Crnich, C. J., Mody, L., Bradley, S. F., Nicolle, L. E., & Yoshikawa, T. T. (2018). Infectious diseases in older adults of Long-Term care facilities: Update on

approach to diagnosis and management. *Journal of the American Geriatrics Society*, 66(4), 789-803. doi:10.1111/jgs.15248

Juthani-Mehta, M., Tinetti, M., Perrelli, E., Towle, V., Van Ness, P. H., & Quagliarello, V. (2007). Diagnostic accuracy of criteria for urinary tract infection in a cohort of nursing home residents. *Journal of the American Geriatrics Society*, 55(7), 1072-1077. doi:10.1111/j.1532-5415.2007.01217.x

Laerd Statistics. (2018). McNemar's test in SPSS statistics - procedure, output and interpretation of the output using a relevant example | laerd statistics. Retrieved from <https://statistics.laerd.com/spss-tutorials/mcnemars-test-using-spss-statistics.php>

Lim, C. J., Kong, D. C. M., & Stuart, R. L. (2014). Reducing inappropriate antibiotic prescribing in the residential care setting: Current perspectives. *Clinical Interventions in Aging*, 9, 165-177. doi:10.2147/CIA.S46058

Mayne, S., Sundvall, P., & Gunnarsson, R. (2018). Confusion strongly associated with antibiotic prescribing due to suspected urinary tract infections in nursing homes. *Journal of the American Geriatrics Society*, 66(2), 274-281. doi:10.1111/jgs.15179

McMaughan, D. K., Nwaiwu, O., Frentzel, E., Mehr, D., Imanpour, S., Garfinkel, S., Zhao, H. (2016). Impact of a decision-making aid for suspected urinary tract infections on antibiotic overuse in nursing homes. *BMC Geriatrics*, 16, 1-9. doi:10.1186/s12877-016-0255-9

Meddings, J., Saint, S., Krein, S. L., Gaies, E., Reichert, H., Hickner, A., Mody, L. (2017). Systematic review of interventions to reduce urinary tract infection in nursing home residents. *Journal of Hospital Medicine*, 12(5), 356-368. doi:10.12788/jhm.2724

- Mylotte, J. (2019). Nursing home or long-term care facility patients. Retrieved from <https://www.infectiousdiseaseadvisor.com/home/decision-support-in-medicine/hospital-infection-control/nursing-home-or-long-term-care-facility-patients/>
- National Center for Health Statistics. (2019). Long-term care providers and services users in the united states, 2015–2016. Vital and Health Statistics, 3(43) Retrieved from [https://www.cdc.gov/nchs/data/series/sr\\_03/sr03\\_43-508.pdf](https://www.cdc.gov/nchs/data/series/sr_03/sr03_43-508.pdf)
- Pasay, D. K., Guirguis, M. S., Shkrobot, R. C., Slobodan, J. P., Wagg, A. S., Sadowski, C. A., Bresee, L. C. (2019). Antimicrobial stewardship in rural nursing homes: Impact of interprofessional education and clinical decision tool implementation on urinary tract infection treatment in a cluster randomized trial. *Infection Control and Hospital Epidemiology*, 40(4), 432-437. doi:10.1017/ice.2019.9
- Pattison, S. E. (2019). Improving the management of asymptomatic bacteriuria in older adults in long-term care
- Potter, M., & Tinker, S. (2000). Put power in nurses' hands: Orlando's nursing theory supports nurses -- simply. *Nursing Management*, 31(7), 40-41. Retrieved from <https://search.ebscohost.com/login.aspx?direct=true&db=rzh&AN=107127682&site=ehost-live&scope=site>
- Salem-Schatz, S., Griswold, P., Kandel, R., Benjamin-Bothwell, S., DeMaria, A., McElroy, N., Doron, S. (2020). A statewide program to improve management of suspected urinary tract infection in Long-Term care. *Journal of the American Geriatrics Society*, 68(1), 62-69. doi:10.1111/jgs.16261

Squire 2.0. (2008). Retrieved from <http://squire->

[statement.org/index.cfm?fuseaction=Page.ViewPage&PageID=471](http://statement.org/index.cfm?fuseaction=Page.ViewPage&PageID=471)

Stone, N. D., Ashraf, M. S., Calder, J., Crnich, C. J., Crossley, K., Drinka, P. J., . . . Stevenson,

K. B. (2012). Surveillance definitions of infections in long-term care facilities: Revisiting the McGeer criteria. *Infection Control & Hospital Epidemiology*, 33(10), 965-977.

doi:10.1086/667743

van Buul, L. W., Veenhuizen, R. B., Achterberg, W. P., Schellevis, F. G., Essink, Rob T. G. M.,

de Greeff, S. C., Hertogh, Cees M. P. M. (2015). Antibiotic prescribing in dutch nursing homes: How appropriate is it? *Journal of the American Medical Directors Association*,

16(3), 229-237. doi:10.1016/j.jamda.2014.10.003

Viner, S. (2020). Urinary tract infection knowledge of long-term care nursing staff: The effect of

an educational intervention. *Urologic Nursing*, 40(1), 7-21. doi:10.7257/1053-

816X.2020.40.1.7

Yeager, K. SPSS tutorials: Paired samples t test. Retrieved from

<https://libguides.library.kent.edu/SPSS/PairedSamplestTest>



Appendix A

**Table A1: Revised McGeer Criteria for UTI Surveillance**

Table 2. Urinary Tract Infection (UTI) Surveillance Definitions		
Syndrome	Criteria	Selected Comments*
UTI without indwelling catheter	<p><b>Must fulfill both 1 AND 2.</b></p> <p>□ 1. At least one of the following sign or symptom</p> <ul style="list-style-type: none"> <li>□ Acute dysuria or pain, swelling, or tenderness of testes, epididymis, or prostate</li> <li>□ Fever or leukocytosis, and ≥ 1 of the following:                             <ul style="list-style-type: none"> <li>□ Acute costovertebral angle pain or tenderness</li> <li>□ Suprapubic pain</li> <li>□ Gross hematuria</li> <li>□ New or marked increase in incontinence</li> <li>□ New or marked increase in urgency</li> <li>□ New or marked increase in frequency</li> </ul> </li> <li>□ If no fever or leukocytosis, then ≥ 2 of the following:                             <ul style="list-style-type: none"> <li>□ Suprapubic pain</li> <li>□ Gross hematuria</li> <li>□ New or marked increase in incontinence</li> <li>□ New or marked increase in urgency</li> <li>□ New or marked increase in frequency</li> </ul> </li> </ul> <p>□ 2. At least one of the following microbiologic criteria</p> <ul style="list-style-type: none"> <li>□ ≥ 10<sup>5</sup> cfu/mL of no more than 2 species of organisms in a voided urine sample</li> <li>□ ≥ 10<sup>2</sup> cfu/mL of any organism(s) in a specimen collected by an in-and-out catheter</li> </ul>	<p>The following 2 comments apply to both UTI with or without catheter:</p> <ul style="list-style-type: none"> <li>• UTI can be diagnosed without localizing symptoms if a blood isolate is the same as the organism isolated from urine and there is no alternate site of infection</li> <li>• In the absence of a clear alternate source of infection, fever or rigors with a positive urine culture result in the non-catheterized resident or acute confusion in the catheterized resident will often be treated as UTI. However, evidence suggests that most of these episodes are likely not due to infection of a urinary source.</li> </ul> <ul style="list-style-type: none"> <li>• Urine specimens for culture should be processed as soon as possible, preferably within 1-2 h</li> <li>• If urine specimens cannot be processed within 30 min of collection, they should be refrigerated and used for culture within 24 h</li> </ul>
UTI with indwelling catheter	<p><b>Must fulfill both 1 AND 2.</b></p> <p>□ 1. At least one of the following sign or symptom</p> <ul style="list-style-type: none"> <li>□ Fever, rigors, or new-onset hypotension, with no alternate site of infection</li> <li>□ Either acute change in mental status or acute functional decline, with no alternate diagnosis and leukocytosis</li> <li>□ New-onset suprapubic pain or costovertebral angle pain or tenderness</li> <li>□ Purulent discharge from around the catheter or acute pain, swelling, or tenderness of the testes, epididymis, or prostate</li> </ul> <p>□ 2. Urinary catheter specimen culture with ≥ 10<sup>5</sup> cfu/mL of any organism(s)</p>	<ul style="list-style-type: none"> <li>• Recent catheter trauma, catheter obstruction, or new onset hematuria are useful localizing signs that are consistent with UTI but are not necessary for diagnosis</li> </ul> <ul style="list-style-type: none"> <li>• Urinary catheter specimens for culture should be collected after replacement of the catheter if it has been in place &gt;14 d</li> </ul>
<p>□ <b>UTI criteria met</b></p>		<p>□ <b>UTI criteria <u>NOT</u> met</b></p>

**Table A2: Literature Search**

Date of Search	Keyword Used	Database/Source Used (CINAHL, OVID, Proquest, Google Scholar, etc.)	# of Hits		
			Listed	Reviewed	Used
6/25/20	Long-term care OR nursing home OR residential care AND urinary tract infection OR UTI	CINAHL	1,117	55	6
6/25/20	Long-term care OR nursing home OR residential care AND urinary tract infection OR UTI	PubMed	1,971	85	2
6/25/20	Long-term care OR nursing home OR residential care AND urinary tract infection OR UTI	OVID	2,396	74	3
6/30/20	Long-term care OR nursing home OR residential care AND urinary tract infection OR UTI AND guidelines OR protocols	CINAHL	155	56	2

**Table A3: Data Collection**

<u>Source/Year/ Author</u>	<u>Author/Purpose</u>	<u>Sample/ Setting</u>	<u>Design Framework</u>	<u>Variables/ Instruments</u>	<u>Results</u>	<u>Implications</u>	<u>*Level of Evidence</u>
CINAHL/2019	Cooper, McFarland, Petrilli, & Shells/Reducing antibiotic prescribing for UTIs in nursing homes	120 bed long-term care facility	Pre-post experimental design	UTI symptom toolkit implemented	Significant improvement in UTI rates	UTI symptom toolkit can help to reduce UTI rates in long-term care facilities	Level 2
CINAHL/ 2014	Fleet et al./ To evaluate the impact of a novel antimicrobial stewardship tool on systemic antibiotic use for treatment of infection in nursing homes	1628 pre-intervention and 1610 post-intervention	A pilot cluster randomized control study	Implementation of antimicrobial toolkit for evaluating infections	The pre- and post-intervention of systemic antibiotic prescribing for treatment of infection was 6.46% and 6.52% in the IG [estimated prevalence ratio: 1.01 (95% CI: 0.81-1.25), P=0.94] compared with 5.27% and	The study demonstrated that use of the toolkit was associated with a statistically significant decrease in total antibiotic consumption	Level 1

					5.83%, in the CG		
CINAHL/ 2017	Fleming, Barry, Byrne, & Prentice/ To investigate antimicrobial susceptibility in urine samples submitted to the Microbiology Laboratory at Cork University Hospital from LTCFs	Analysis of the antimicrobial susceptibilities of urine samples submitted to the microbiology laboratory at CUH in quarter one of 2011-2014	Observational Study	Retrospective analysis of long-term care urine samples compared to general population urine samples	A significant reduction in susceptibility to co-amoxiclav was found between Q1 2011 and Q1 2014 in both settings (GP P = 0.013, LTCF P=0.005)	Long-term care facility urine samples are less sensitive to antibiotics than the general population	Level 3
CINAHL/ 2016	Freeman-Jobson/ To evaluate the change in knowledge from prior to and following an evidence-based education presentation	42 licensed and non-licensed healthcare workers	Pre-post quality improvement project	Education on urinary tract infection recognition	Paired sample, dependent, t-test results detected a significant improvement in knowledge	Education about UTI symptoms and detection is beneficial to increase knowledge and awareness	Level 3

CINAHL/ 2019	Gómez Belda et al./  To determine the rate of inadequate empirical antimicrobial treatment in older nursing home residents with UTI	181 nursing home patients	Multicentric prospective observational study in five Spanish hospitals	The percentage of inadequate empirical antibiotic treatment, length of hospital stay and mortality were evaluated	The percentage of extended-spectrum beta-lactamases was higher in patients from nursing homes (30.6% vs 16.3%; P = 0.045), as was the percentage of inadequate empirical antibiotic treatment (40% vs 20.7%; P = 0.005	Nursing home patients with urinary tract infections had a higher rate of antibiotic resistance and inadequate empirical antimicrobial treatment	Level 3
CINAHL/ 2018	Haaijman, Stobberingh, van Buul, Hertogh, C. M. P. M., & Horninge/  To determine long—term care provider prescribing practices pertaining to UTIs	13 long-term care providers	Retrospective analysis	Assessment of antibiotic prescriptions for UTIs and urine cultures was performed from July 2014 to January 2016	There was a discrepancy between the actions that seemed logical based on the culture results and the actions	In the majority of patients, antibiotic therapy was not adjusted when the urine culture results suggested it may be appropriate.	Level 3

	and comparing it to evidence based-practice				that were actually taken in 75% of the cases		
PubMed/ 2007	Juthani-Mehta et al./ To evaluate nursing home residents with suspected UTI to determine whether they met the McGeer, Loeb, or revised Loeb consensus-based criteria	340 long-term care residents in 3 New Haven–area nursing homes	Prospective cohort study	Participants underwent prospective surveillance from May 2005 to April 2006 for the development of suspected UTI	Using laboratory evidence of UTI as the outcome, the McGeer criteria demonstrated 30% sensitivity, 82% specificity, 57% positive predictive value (PPV), and 61% negative predictive value	Using the McGeer criteria can help to identify long-term residents with UTI	Level 2
PubMed/ 2018	Mayne, Sundvall, & Gunnarsson/ To quantify the prevalence of documented UTI,	450 nursing home residents	Cross-sectional	Chart reviews of NH residents between August 28, 2015, and June 21, 2016,	UTI accounted for 33% of all current infections treated with	UTI is commonly documented in NH residents, with new or worsening confusion being one	Level 2

	nonspecific symptoms, and antibiotic treatment of suspected UTI in nursing homes			to determine the prevalence of documented UTI, new or worsening nonspecific and specific symptoms that are specific or nonspecific to the urinary tract, antibiotic use, medical conditions, and medication factors	antibiotics and 40% of all infections treated with antibiotics within the last 30 days. One in 5 NH residents had received antibiotics within the last 30 days, of which 45% were for UTI.	of the strongest factors associated with antibiotic treatment for suspected UTI.	
Ovid/2016	McMaughan et al./ To test the effectiveness of a decision-making aid for urinary tract infection management on reducing antibiotic prescriptions for suspected UTI	547 nursing home residents in 12 nursing homes in Texas	A pre- and post-test with comparison group design was used with retrospective analysis	The main measurement for the outcome variable was whether an antibiotic was prescribed for suspected urinary tract infections with no symptoms present	Exposure to the decision-making aid decreased the number of prescriptions written for ASB (from 78 % to 65 % in the low-intensity homes and	The decision-making aid improved antibiotic stewardship in nursing homes.	Level 3

					from 65 % to 57 % in the high-intensity homes		
Ovid/2017	Meddings et al./ Systematic literature review of strategies to reduce UTIs in nursing home residents	Interventional studies with a comparison group reporting at least 1 outcome for: catheter-associated UTI (CAUTI), UTIs not identified as catheter-associated, bacteriuria, or urinary catheter	Systematic Review	Two authors abstracted study design, participant and intervention details, outcomes, and quality measures	Five studies showed CAUTI reduction (1 significantly); 9 studies showed UTI reduction (none significantly); 2 studies showed bacteriuria reduction (none significantly). Four studies showed reduced catheter use (1 significantly).	Several practices, often implemented in bundles, such as improving hand hygiene, reducing and improving catheter use, managing incontinence without catheters, and enhanced barrier precautions, appear to reduce UTI or CAUTI in nursing home residents	Level 1



		use. 5794 records retrieved					
Ovid/2019	Pasay et al./ To measure the impact of an antimicrobial stewardship initiative on the rate of urine culture testing and antimicrobial prescribing for urinary tract infections (UTIs) between control and intervention sites	42 nursing homes	Cluster randomized controlled trial	Intervention sites received on-site staff education, physician academic detailing, and integrated clinical decision-making tools. Control sites provided standard care	Statistically significant decreases in the rate of urine culture testing (-2.1 tests per 1,000 resident days [RD]; 95% confidence interval [CI], -2.5 to -1.7; P < .001) and antimicrobial prescribing for UTIs (-0.7 prescriptions per 1,000 RD; 95% CI, -1.0 to -0.4; P < .001) were observed in the intervention group	A multimodal antimicrobial stewardship intervention in rural nursing homes significantly decreased the rate of urine culture testing and antimicrobial prescriptions for UTI, with no increase in hospital admissions or mortality	Level 1

CINAHL/ 2019	Pattison/ The purpose was to assess if the implementation of an antibiotic stewardship program in the nursing home setting decreases the rate of antibiotics prescribed for ASB in older adults	Multiple studies all involving long-term residents in nursing homes	Quality improvement project / Retrospective review	An antibiotic stewardship program consisting of an educational session about antibiotic stewardship and a decision-making tool was implemented and utilized by nurses and providers	Baseline data revealed that 64% of antibiotic prescriptions written for suspected UTIs were aimed at ASB. Exposure to the antibiotic stewardship program decreased the rate of antibiotic prescriptions written for ASB by 18%, as the rate of antibiotics written for ASB in the post intervention period was 46%	The antibiotic stewardship program and decision-making tool decreased the rate of antibiotics prescribed for ASB in older adults in the long-term care setting	Level 3
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CINAHL/ 2020	Viner/ To determine if providing an educational intervention for long-term care facility nursing staff improves knowledge and prevention of urinary tract infections	21 long-term nurses	Longitudinal study design and a previously developed questionnaire, data were collected prior to and after a UTI-specific educational intervention	UTI education was implemented to nursing staff	Using paired sample t test, knowledge and prevention of UTI scores improved	Providing an educational intervention for long-term care facility nursing staff improves knowledge and prevention of urinary tract infections	Level 3
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*Appendix B***Primary Investigator Assessment of Knowledge of UTI Surveillance Based on the Revised McGeer Criteria**

<b>Question 1: Confusion alone is an acceptable reason for obtaining a UA/C&amp;S in a patient without a urinary catheter.</b>	<b>True or False</b>
<b>Question 2: A patient without a urinary catheter has burning with urination, so a UA/C&amp;S should be obtained immediately.</b>	<b>True or False</b>
<b>Question 3: Patient without a urinary catheter states that they have UTIs frequently and they feel like another one is coming on because their urine is reported to be dark in color. A UA/C&amp;S should be obtained.</b>	<b>True or False</b>
<b>Question 4: A patient without a urinary catheter has a fever with no other urinary symptoms. A UA/C&amp;S should be obtained as the first intervention.</b>	<b>True or False</b>
<b>Question 5: A patient without a urinary catheter develops acute dysuria, increased urinary urgency and frequency. A UA/C&amp;S should be obtained.</b>	<b>True of False</b>
<b>Question 6: A patient with a urinary catheter develops acute change in mental status. A UA/C&amp;S should be obtained.</b>	<b>True or False</b>
<b>Question 7: In long-term care, urine cultures should be used in conjunction with symptoms to treat UTIs</b>	<b>True or False</b>
<b>Question 8: A patient without a urinary catheter does not have fever but has acutely developed dysuria, urinary incontinence and urgency. A UA/C&amp;S should be obtained</b>	<b>True or False</b>
<b>Question 9: A patient's urine culture resulted in no growth, but the patient still has dysuria. The nurse should call the medical provider because the patient should be treated with antibiotics anyway.</b>	<b>True or False</b>
<b>Question 10: Patients with urinary catheters have a different set of criteria for treating UTIs versus patients without urinary catheters.</b>	<b>True or False</b>

<b>Question 11: A patient's family feels that the patient has a UTI and demands that antibiotics be started. This is an appropriate reason to initiate antibiotics.</b>	<b>True or False</b>
<b>Question 12: A urine culture grows out bacteria from the urine sample, but the patient is asymptomatic. The patient should not be treated with antibiotics.</b>	<b>True or False</b>
<b>Question 13: A patient with a urinary catheter has purulent drainage noted from around the catheter site. The patient meets criteria for obtaining a UA/C&amp;S.</b>	<b>True or False</b>
<b>Question 14: In a patient without a urinary catheter, suprapubic pain alone meets criteria for obtaining a UA/C&amp;S.</b>	<b>True or False</b>
<b>Question 15: In a patient with a urinary catheter, suprapubic pain alone meets criteria for obtaining a UA/C&amp;S.</b>	<b>True or False</b>
<b>Answer Key:</b>	<b>1. F 2. F 3. F 4. F 5. T 6. T 7. T 8. T 9. F 10. T 11. F 12. T 13. T 14. F 15. T</b>

*Appendix C***Invitation to Participate in Scholarly Project**

Dear Licensed Healthcare Worker,

My name is Chase Gunter, and I am a DNP student at the University of Alabama. I am conducting a scholarly project here at Ridgeview Health Services, and I am inviting you to participate in the study. Your participation is entirely voluntary, and there is no penalty if you decide not to participate. The purpose of the project is to educate healthcare workers on evidence based UTI surveillance and treatment criteria within long-term care facilities. The goal of this education is to improve the training of interdisciplinary staff on UTI surveillance and implementing the Revised McGeer Criteria within the facility to evaluate its effect on documented UTIs and antibiotic prescribing rates.

If you choose to participate, various in-service dates and times will take place to provide convenience to participants. The participants will be given a pre-education test followed by a post-education test after the education is given concerning the implementation of the UTI toolkit and evidence-based practice for UTI surveillance. Both the pre and post tests will be numbered as to allow for the tracking of the participant's scores, but the tests will be anonymous and free of identifying information. There will be a drop box for participants to place their questionnaires inside, as to further protect anonymity. Test results will be analyzed to determine the effectiveness of the education. After this phase is complete, the implementation phase of the project will begin. Implementation of evidence based UTI toolkit will take effect and will last four weeks. During this time, the project director will be available to answer questions that staff may have concerning the new protocol. After the eight-week study, the post-implementation phase will then take place. The UTI occurrence rates and UTI antibiotic prescribing rates will be re-collected and analyzed. The results will be compared to pre-implementation data to evaluate the effectiveness of the UTI toolkit. Opportunities for anonymous feedback will be available. A suggestion box will available for participants to voice any concerns, barriers, or problems that were identified. Feedback from participants is encouraged.

Inservice dates and times: TBD

Thank you,

Chase Gunter, MSN, FNP-C

DNP Student at the University of Alabama

*Appendix D***Informed Consent to Participate**

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**[Informed Consent Form for Licensed Healthcare Workers]****PART I: Information Sheet****Introduction**

Urinary tract infections (UTIs) are one of the most common infections within residents of long-term care facilities. Antibiotics are commonly prescribed for patients in this setting without proper justification and diagnosis criteria. The over-prescribing of antibiotics can lead to other complications and secondary infections. For these reasons, proper diagnosis of UTIs and reserving treatment for symptomatic patients should be a priority in order to decrease the antibiotic prescribing rates and untimely improve patient health outcomes. The proposed project intervention is aimed at training interdisciplinary staff on UTI surveillance and implementing the Revised McGeer Criteria within a 148-bed long-term care facility to evaluate the effect on documented UTIs and antibiotic prescribing rates.

**Method of Research**

The project will be implemented in at [REDACTED], a 148-bed, long-term care facility in rural Northwest Alabama. A pre-post-test intervention will be conducted to evaluate the education provided to licensed facility staff. A UTI surveillance toolkit will then be implemented for healthcare staff to utilize and pre-post data concerning UTI rates and antibiotic prescribing rates will be compared to determine the effectiveness of the project at reducing both UTI occurrence rates and UTI antibiotic prescribing rates.

**Participant selection**

We are inviting all licensed healthcare workers who work at [REDACTED] to participate in this project concerning evidence based UTI symptom surveillance and treatment.

**Voluntary Participation**

Your participation in this research is entirely voluntary. It is your choice whether to participate or not. There will be no penalty if you decide not to participate.

**Procedures and Protocol**

Various in-service dates and times will take place to provide convenience to participants. The participants will be given a pre-education questionnaire to determine baseline knowledge involving evidence based UTI surveillance and treatment. After this pre-test, education will be provided by the primary investigator in the form of a PowerPoint presentation concerning evidence-based practice for UTI surveillance and treatment. After the education, a post-education

questionnaire will then be administered to determine the effectiveness of the education that was provided. Both the pre- and post-education questionnaires will be numbered as to allow for the tracking of the participant's scores, but the questionnaires will be anonymous and free of identifying information. There will be a drop box for participants to place their questionnaires inside, as to further protect anonymity. After this pre-intervention phase is complete, the implementation phase of the project will begin. Implementation of the evidence based UTI toolkit will take effect and will last four weeks. During this time, the project director will be available to answer questions that staff may have concerning the new protocol. After these four weeks, the post-implementation phase will then take place. The UTI occurrence rates and UTI antibiotic prescribing rates will be re-analyzed. The results will be compared to pre-implementation data to evaluate the effectiveness of the project. Opportunities for anonymous feedback will be available. A suggestion box will be available for participants to voice any concerns, barriers, or problems that were identified. Feedback from participants is encouraged. If you choose to participate, you are agreeing to participate in the anonymous pre-test, educational in-service, anonymous post-test, and provide feedback/suggestions following the completion of the project.

## **PART II: Certificate of Consent**

**I have read the foregoing information, or it has been read to me. I have had the opportunity to ask questions about it and any questions that I have asked have been answered to my satisfaction. I consent voluntarily to participate as a participant in this project.**

**Print Name of Participant** \_\_\_\_\_

**Signature of Participant** \_\_\_\_\_

**Date** \_\_\_\_\_  
**Day/month/year**

**A copy of this ICF has been provided to the participant.**

**Print Name of Researcher/person taking the consent** \_\_\_\_\_

**Signature of Researcher /person taking the consent** \_\_\_\_\_

**Date** \_\_\_\_\_  
**Day/month/year**



*Appendix E*

**Interdisciplinary Pathway for Managing Urinary Tract Infections in Long-Term Care Facilities**

**Feedback/Suggestion Form**

1. Were the guidelines easy to follow?
  
2. Why or why not?
  
3. Were there any barriers that affected adherence to the guidelines?
  
4. What measures could be taken to improve the process?
  
5. Additional comments or suggestions?